

The Barwon estuary – an example of the estuarine management situation in Victoria

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Abstract

The importance of Australian estuaries is well established. However, the management of these estuaries is not receiving appropriate attention. This paper examines the management situation of estuaries in Australia through a catchment level assessment of the Barwon estuary. The study finds that there are potential gaps between the relevant management agencies. The study identifies the reasons for these gaps. The study also reveals that there are many opportunities through which estuaries could be managed very effectively. The study finally suggests the effective management approach for estuaries in Australia. (*The Victorian Naturalist* 123 (2), 2006, 84-90)

Introduction

This paper examines the management situation of Australian estuaries through a micro-level assessment of the Barwon estuary. Estuaries in Australia are extremely important in terms of social, economic and environmental values. They are widely exploited for numerous diverse purposes (NLWRA 2000a), and thereby suffer many negative effects (Boxshall 2001). Nonetheless, effective management of Australian estuaries is still missing.

Australia has over 1000 estuaries, and most Australians live in towns and cities situated on or near estuaries (NLWRA 2000a). Many studies (e.g. Hancock 1995; Hutching and Saenger 1987; Saenger 1991) have emphasised the significance of Australian estuaries to commercial and recreational fishing. Australia's recreational fishing industry is worth over \$2.9 billion each year and at least 60% occurs within estuaries (NLWRA 2000b). Production of prawns from the northern prawn fishery was worth over \$107m in 1999/2000 (ABARE 2001).

Australian estuaries and their associated morphological units are the foundation of some of the most biologically rich and productive environments in the coastal zone (Butcher and Saenger 1994). The dominant ecological habitats found in Australian estuaries are salt marshes, mangroves, sea-grass meadows, sandflats and mudflats (Morrissey 1995; Adam 1995; Poiner and Peterken 1995).

Despite the importance of estuaries and thus the need for careful management, past

planning and management of estuaries in Australia has not been coordinated or integrated (Harty 2000) and sometimes is ignored (NLWRA 2000a).

This paper examines the management situation of small estuaries in Australia, through a catchment level assessment of the Barwon estuary in Victoria. The Barwon estuary was chosen for the following reasons:

- the region supports a large agricultural industry in its catchments (Loone 1996);
- the estuary has significant national and international importance (Roberts 1993);
- both coastal management programs and catchment management programs are in place in the region; and
- the estuarine environment is being degraded (Corangamite CALP Board 1997; Oliver 2000).

Barwon Estuary System

The Barwon estuary complex exhibits physical, chemical and biological characteristics representative of other Australian estuaries (Sherwood *et al.* 1988). In their study, Sherwood *et al.* (1988) divided the whole estuary complex into four spatial components (Fig. 1):

- Upper Barwon;
- Reedy Lake;
- Lake Connemare; and
- Lower Barwon.

The catchment of the Upper Barwon River and tributaries is located in the north-eastern section of the Otway Range in south-western Victoria. The Upper

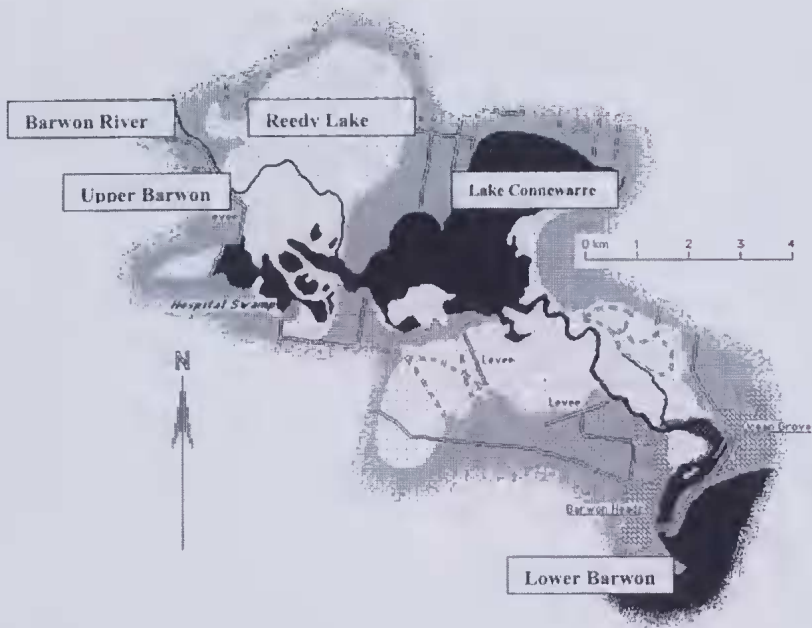


Fig. 1. The Barwon Estuary system

Barwon component of the complex is a river channel approximately 50 m wide, 3 to 4 m deep and about 10 km long (Sherwood *et al.* 1988).

Reedy Lake is the largest freshwater wetland in central Victoria (Glynn 1997), with an approximate area of 12 km² and a mean depth of about 0.6 m (Sherwood *et al.* 1988). It is supplied with fresh water from the Barwon River which has maintained the lake as more or less permanent.

Lake Connewarre is a large (9.5 km²) shallow estuarine lagoon in the lower reaches of the Barwon River (Sherwood *et al.* 1988) and is part of the Lake Connewarre State Game Reserve. Lake Connewarre was listed as an internationally significant wetland under the Ramsar Convention on December 1982 (Roberts 1993) and contains natural vegetation of significance to the region (Roberts 1993).

The Lower Barwon is narrow, 3 to 4 m deep and about 10 km long (Sherwood *et al.* 1988). The organisms characteristic of this section of the complex are essentially estuarine forms that can tolerate a wide range of salinity. Mangrove and mud flats occur along the Lower Barwon (Sherwood *et al.* 1988).

Degradation of waterways in the region due to catchment activities

The Catchment Condition Report (Corangamite CALP Board 1997) identified 22 different degradation issues in the Corangamite region, many directly related to the estuary. The Corangamite CALP Board (1997) identified the most important management issue in the Barwon estuary as the excessive seasonal growth of blue-green algae. Trends at Queens Park, where the Barwon enters Geelong City, indicate increasing levels of phosphorus in the water. High to very high nutrient levels that pose threats to the viability of fish species and other estuarine fauna also have been recorded in the middle reaches of the Barwon River (Corangamite CALP Board 1997). Corangamite Catchment Management Authority (CCMA) (1998) stated that significant progress in waterway management had been achieved in the Corangamite region. Stream-side revegetation, stormwater pollution reduction, erosion control and enhancement of wetland habitats and urban waterways were having a beneficial effect on waterways. Nonetheless, the estuary itself is not getting enough attention. As well as nutrient

problems, other forms of water pollution, nearby industry and beach littering also contribute to estuarine degradation (Adams 2000; Oliver 2000).

Current management of the estuary and its catchment

The management of the Barwon River Catchment falls under the jurisdiction of the CCMA, which provides advice on the management of the land and water resources in the region. The Regional Catchment Strategy (Corangamite CALP Board 1997) addresses issues relating to water quality, waterway management and river health. The Catchment Management Structures Working Party (1997) recommended that the Catchment Management Authority be the principal body for catchments within its region. Establishing close partnership with other organizations within the catchment is the main mechanism for developing relationships. For example, the relationship between Catchment Management Authority and Environment Protection Authority is established through the development of the State Environment Protection Policy (SEPP). As stated by Catchment Management Structures Working Party (1997) the EPA in consultation with the CCMA will develop a set of environmental objectives under the SEPP policy, which will act as the minimum environmental standards to be included within a Regional Catchment Strategy. The CCMA is responsible for the development and implementation of the Attainment

Program required under the SEPP and is included in the Regional Catchment Strategy. Similarly, the relationship with the relevant water authority (Barwon Water) is established through the development of the Regional Catchment Strategy. The CCMA needs to ensure that the water authority is adequately consulted in the development of the Regional Catchment Strategy. The relationship with the Department of Sustainability and Environment (DSE) is developed through the inclusion of a representative on the Authority. The Catchment Management Authority (CMA) has a broad range of natural resource management responsibilities; however, in most cases they relate to a strategic and coordinating role. Working in partnership with other agencies, groups and organizations is, therefore, a key function of the Authority. In this context the CMA is to develop strategic directions for land and water management in the region and to develop and oversee appropriate work programs (DNRE 2000). DSE also assists in the management of the catchment, and is responsible for a number of activities that impact on the health of the region. Other primary management authorities in the area include the following:

- Environment Protection Authority (EPA) – setting policy for waterway health, regulating point source pollution, carrying out water quality monitoring programs, licensing of discharges;
- Barwon Water – responsible for the management of the Barwon River, ensuring

Table 1. Non-governmental organizations working in the Barwon Area.

Name of Groups	Activities	Grant Received from
Leigh and District Landcare Group	Revegetation of the riparian zones of many creeks	DSE
Barrabool Hills Landcare Group	Serrated tussock management (pest plant)	Victorian Farmers Federation
Stonehaven/Fyansford Landcare Group	Pest plant, pest animal and revegetation	Tree Victoria
Friends of Buckley Falls	Revegetation work	DSE
Victorian Field and Game Association	Preserve, restore, develop, maintain water birds' habitat	
Friends of the Bluff	Work closely with Barwon Coast Committee Management Incorporation, the primary activities are weed eradication, revegetation, and operation of an indigenous nursery.	Coastcare

adequate quantities of good quality water are available to consumers and that wastewater is disposed of in accordance with EPA license conditions (Barwon Water 1994);

- Parks Victoria – responsible for the management of Lake Connewarre State Game Reserve;
- City of Greater Geelong – carries out environmental work with Barwon Water and local schools to support the Waterwatch program and the revegetation of riparian zones on major streams (Corangamite CALP Board 1997);
- The Barwon Coast Committee of Management Incorporation (BCCMI) – is responsible for management of the foreshore reserves;
- Golden Plains Shire – actively supports local Landcare groups and projects, and the Corangamite Salinity Program.

In addition to these primary management authorities there are a number of community-based volunteer groups and Non-Governmental Organisations involved in the environmental management of the Barwon River and catchment (Table 1). It should be noted that there are two major Statewide environmental water quality monitoring programs in Victoria. These are: (1) the Victorian Water Quality Monitoring Network (VWQMN) managed by DSE. The VWQMN is contracted out to Water Ecoscience Pty. Ltd., with funding provided by DSE, four regional water authorities and Melbourne Water; (2) a network of fixed sites run and funded by the Environmental Protection Authority (EPA).

The VWQMN has three main components to monitor (Hunter 1993; Hunter and Zampatti 1994; Hunter and Hedger 1995) – rivers and streams, lakes and reservoirs, and wetlands. The EPA Fixed Site Network monitored 20 rivers and streams in 1996 throughout the State, and five lakes in the Western District of Victoria (VWQMN 1998).

Surprisingly, none of the programs has responsibilities to monitor estuaries. In the words of CALPC, DNRE and EPA (1996), 'Estuaries are poorly represented in the statewide water quality programs; consideration needs to be given to developing an estuarine component to VWQMN'. In this

context, Jackson (pers. comm. 2000) indicated that there are many organisations working; however no one is doing work for the estuary. Oliver (2000), reported that the Barwon has always been neglected, therefore becoming more polluted day by day.

The above discussion reveals that, despite many organisations working around the estuary, there is no single authority responsible for the management of the estuary itself. There is no management plan for the estuary. At present, regulations exist for water quality management but they are generally applied under the different jurisdictions of each separate management agency. This results in fragmentation of responsibilities and an uncoordinated approach. The emphasis on reducing nitrogen and phosphorus levels has directed attention away from other important management issues, such as protection of estuarine shorelines, erosion, estuarine beach littering and clearing of native vegetation.

Scope for the better management of the estuary

Although the Barwon estuary itself is not receiving enough management attention, there are ample opportunities through which the Barwon could be managed very effectively. The establishment of two natural resource management programs in Victoria, that is, catchment and coastal management, has produced a means of better management not only for the Barwon estuary, but also for other estuaries in the State.

The relationship of Catchment Management Authorities with the Victorian Coastal Council

The *Coastal Management Act 1995* makes provision for the preparation of a Victorian Coastal Strategy and Coastal Action Plans and Management Plans for coastal Crown Land. Estuaries fall under the definition of Coastal Crown Land under the Act as:

Coastal Crown Land means-

(a) any land reserved under the *Crown Land (Reserves) Act 1978* for the protection of coastline;

(b) any Crown Land within 200 metres of

the high water mark of-

- i. the coastal waters of Victoria; or
- ii. any sea within the limits of Victoria;
- (c) the sea bed of the coastal waters of Victoria;
- (d) the sea bed of any sea within the limits of Victoria; and
- (e) any Crown Land which is declared by the Governor-in-Council under sub-section (2) to be coastal Crown Land - but does not include any land which the Governor-in-Council declares under sub-section (2) not to be coastal Crown Land for the purposes of this Act.

Therefore, coastal Crown Land includes all the estuaries of the Victorian coast and these are subject to the provisions of the *Coastal Management Act 1995*. In this context, not only the Barwon estuary but all other estuaries come under the custody of the *Coastal Management Act 1995*.

On the other hand, the Catchment Management Structures Working Party (1997) has delineated the responsibilities of Regional Coastal Boards on coastal land as 'Coastal Boards should focus their activities solely on the coastal fringe with Catchment Management Authorities being the primary organization within the catchment.' In their statement the Catchment Management Structures Working Party (1997) has indicated that 'there is some potential for confusion over the role of Coastal Boards and Catchment Management Authorities because the boundaries of the Coastal Boards' influence extend into the catchment.' Therefore, a formal mechanism for liaison was required to establish the relation between Coastal Boards and Catchment Management Authorities (CMAs). However, no principal guideline for a coordinating mechanism has been formed between them. Therefore, the link between catchment and coastal programs is ill defined.

Scope for effective management of the estuary through proper links between the catchment and coastal management programs

Management of estuaries should be linked with two components - catchment and coastal components. Thus the management efforts would involve catchment and

coastal authorities, as well as the many other State and Commonwealth government bodies and private landowners. In recent years, catchment management has undertaken initiatives in minimising nutrient import from catchment activities, especially from agricultural activities, which could improve estuarine as well as coastal water quality and, ultimately, estuarine environments. The establishment of the CCMA in 1997 has coordinated waterways management across the region and achieved significant progress in waterways management (CCMA 1998). On the other hand, coastal management can protect estuaries from activities occurring within the coastal zone. The Victorian Coastal Strategy (VCC 1997) stated that a program to improve the management and conservation of estuaries, bays and river mouths will be established including:

- establishing accountability and responsibility for on-ground management;
- development of criteria for artificially opening river mouths and estuaries;
- establishing minimum criteria for ecological management;
- co-ordination with Catchment Management Authorities to reduce sedimentation and to improve water quality into estuaries and river mouths.

From the above statements it is obvious that both catchment and coastal programs have the vision for the improvement of estuaries. Nonetheless, in effect, estuaries still are not receiving adequate attention, as has been seen from the Barwon River estuary. There are several reasons for this. Firstly, the relevant agencies are not well coordinated because of confusion over responsibilities and power, especially coordination between the Catchment Management Authority and the Coastal Council, which are the two important authorities with major responsibilities for the management of the estuary.

Secondly, legislation for estuarine management is not adequate. In its proposed recommendations in the area of coastal management, the Land Conservation Council (LCC) Victoria emphasized the desirability of creating a focused body for marine, estuarine and coastal area management in Victoria (LCC, 1996). The LCC emphasized that the authority should be

established by legislation to overcome fragmentation of responsibilities and legislative deficiencies in marine, estuarine and coastal area management in Victoria. To date, the role of legislation for estuary management has been overlooked or inadequately appreciated.

Thirdly, estuarine programs are inadequate. There are many catchment programs such as water quality monitoring programs in waterways and streams, re-vegetation programs, community education programs etc. However, no program has yet been brought to focus on the estuary itself.

Finally, there is no management plan for the estuary. Indeed, this study could not identify any particular agency responsible for the management of the estuary itself. Lack of plans or guidelines give rise to concern about the importance of estuarine issues. In effect, estuary management plans reflect the agreed position of all regulatory authorities and interested parties in relation to the future nature conservation, rehabilitation and development of the estuary. In the absence of a management plan, neither the catchment nor the coastal programs are combining their efforts for the management of the estuary.

Catchment management plans and coastal action plans are appropriate means to address management issues affecting smaller estuaries in Victoria (ECC 2000). Properly linked management of estuaries should be captured within catchment and coastal management programs. To do this, a bridge is needed between catchment and coastal management programs. This study argues that estuary management plans can set up that bridge to connect the gap.

Conclusion

The Barwon estuary provides an example of the management situation of estuaries in Victoria, especially for small estuaries. Most of the environmental issues in the estuary have resulted from a wide variety of land and waterway uses and activities. Excessive nutrients in the estuarine water, habitat loss, increased salinity and other problems are having a significant impact on the estuary. Catchment initiatives for reducing nutrient imports are being improved. However, overall management of the estuary is lacking. As a number of

agencies have some responsibility for the management of rivers and adjacent estuarine areas, there is confusion about which body has ultimate authority and should take responsibility for all management decisions and implementations. For effective management of the estuary, both the catchment and coastal components must be addressed. It is important that the catchment program and coastal program work together to secure sustainable management of the estuary.

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One Hundred Years Ago

A tramp from Healesville to Buxton.

Botanical and Ornithological Notes for September.

By A.D. Hardy, F.L.S. and Mrs. Hardy.

...The walk from Healesville up the Blacks' Spur demands at any time a fair amount of exertion, but on this occasion, with 2 inches of snow on the road at Healesville, the conditions of the tramp at higher altitudes might be anticipated to present some difficulty. Notwithstanding the advice of old residents, who declared the Spur to be impassable on foot, we set out prepared for a rough time, cold feet, and a pedestrian achievement of some novelty. That a member of our Club should be the first lady to cross the Spur to Marysville with a reported foot depth of snow to walk through, and thereby establish a record, was a temptation irresistible.

...At the Maroondah or Watts Bridge, the former site of Fernshaw, the snow depth had perceptibly increased, and we were soon convinced that botanical inquiry was for the time almost impossible, as all but the tall trees and larger shrubs were completely hidden. Further on small branches from the overhanging eucalypts littered the ground, and here and there a great limb, unable to resist the increasing weight, had fallen and grounded the telephone wire. Creaking and cracking branches overhead warned us to get from under in time to avoid the impending danger, while from the more flexible twigs there came frequent and sudden showers of snow, and often heavier masses that fell without warning and drove one's hat down over the ears in a way that was more exciting than pleasant.

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